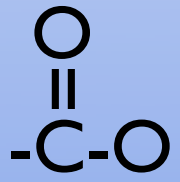
Today

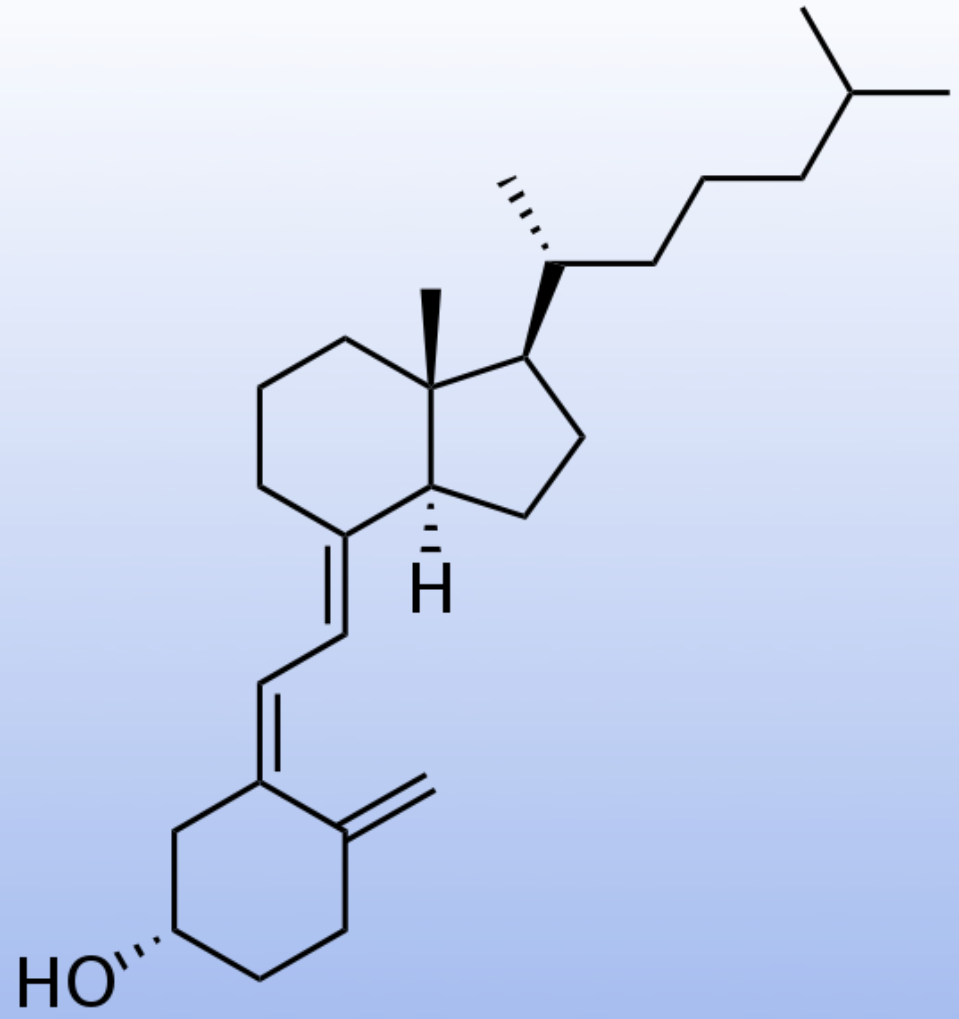
Loose Ends

Reactions

Polymers

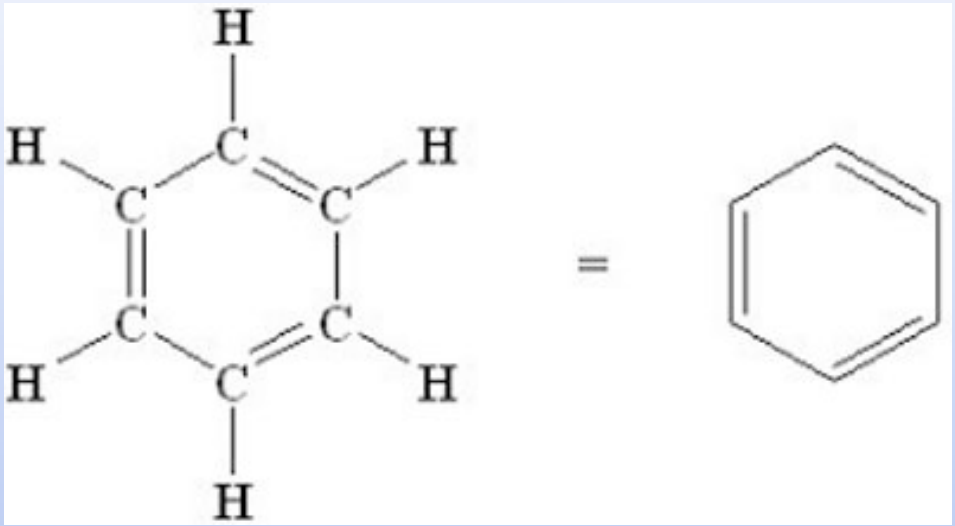
Names for isolated "groups"

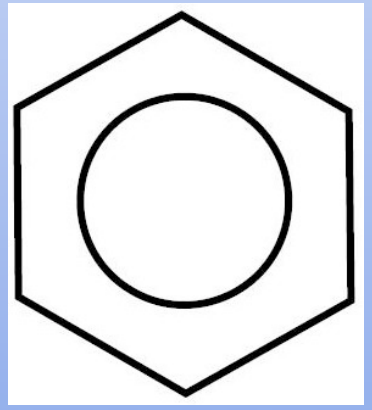
-OH	Hydroxyl
$-NH_2$	Amino
	Carbonyl
	Carboxyl



Vitamin D_4

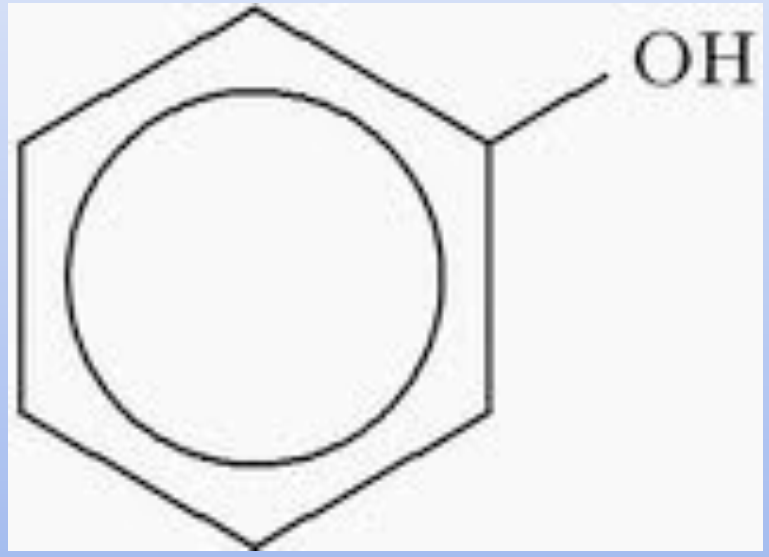
Our friend the benzene ring





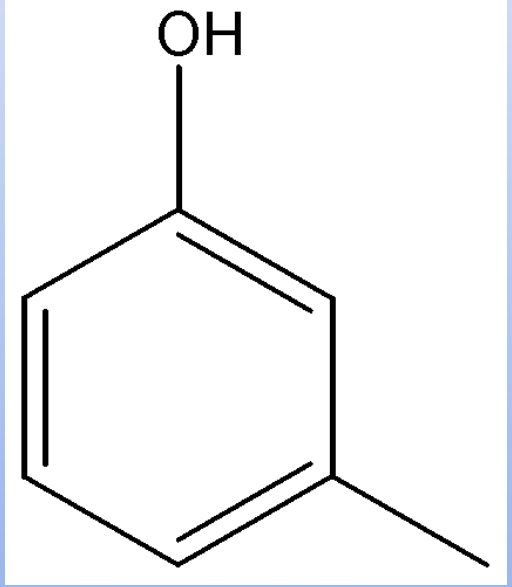
Another important Functional Group

Phenol



Nomenclature

Number carbons clockwise with
#1 starting at the functional group



3 methyl phenol

The chemistry of phenols is

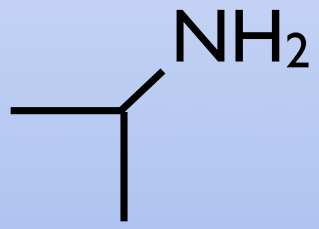
A. essentially the same as that of primary alcohols

B. essentially the same as that of secondary alcohols

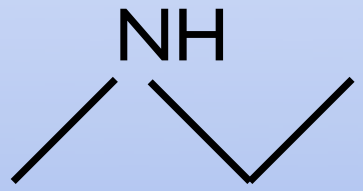
C. essentially the same as that of tertiary alcohols

D. differs substantially from alcohols

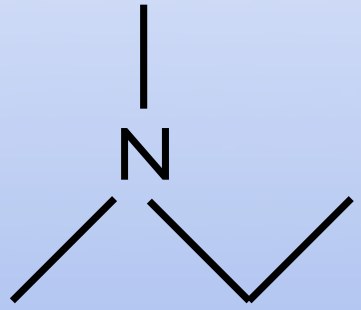
	Primary	Secondary	Tertiary
Amine	R-NH_2	R,R'-NH	R,R',R"-N



1-methyl ethyl amine

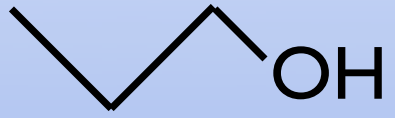


methyl ethyl amine

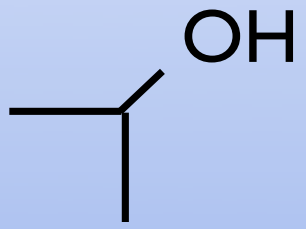


dimethyl ethyl amine

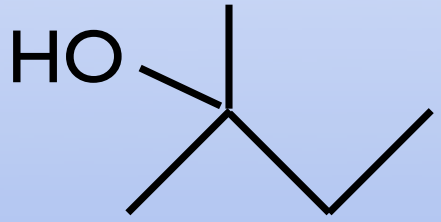
	Primary	Secondary	Tertiary
Alcohol	RCH_2OH	RCHOH	RCOH



1 propanol



2 propanol



2-methyl
2-butanol

2 butanol is a

A. primary alcohol

B. secondary alcohol

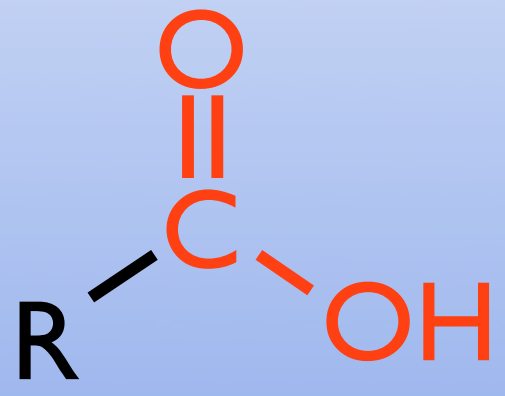
C. tertiary alcohol

Important Reaction for Biochemistry

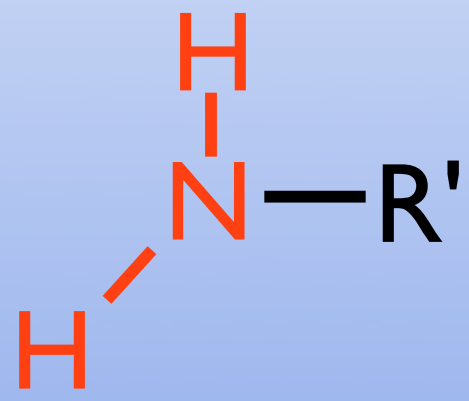
Formation of an Amide

They don't call them functional groups for nothing

Carboxylic Acid

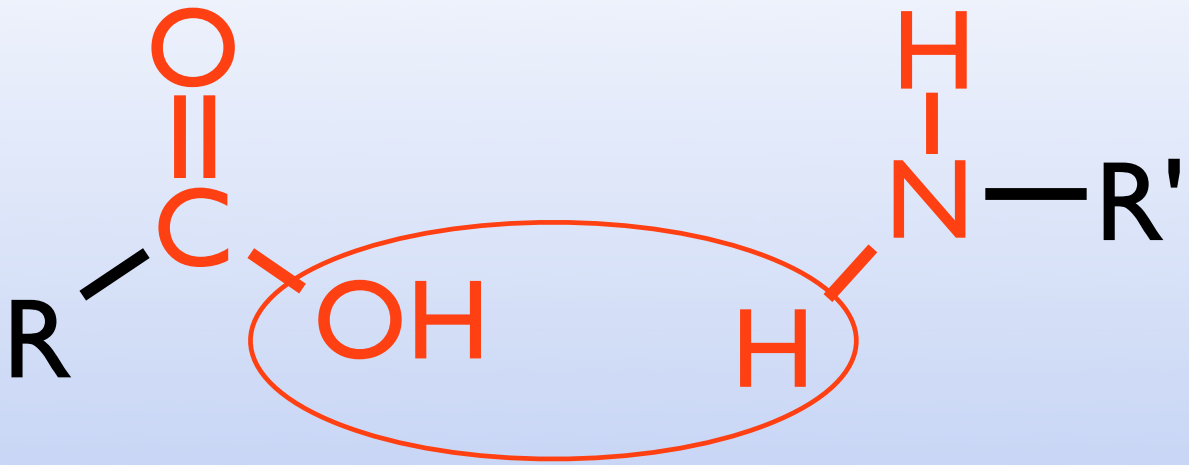


Primary Amine



Carboxylic Acid

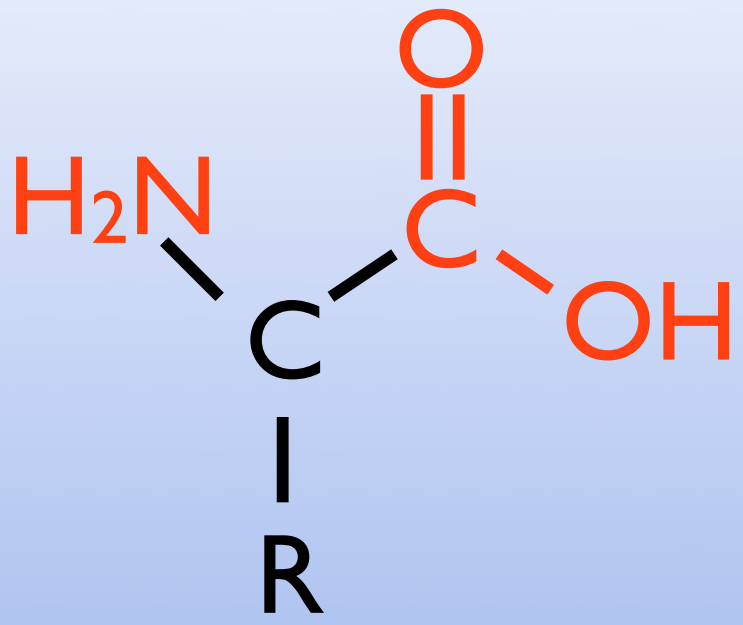
Primary Amine



Amide + Water

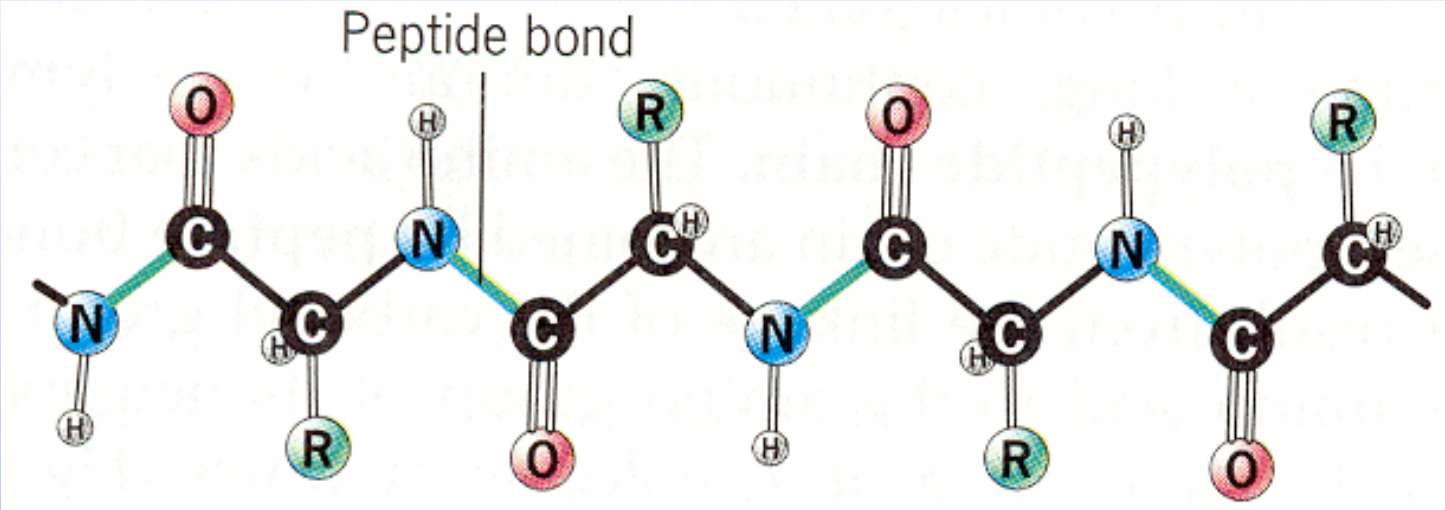
CONDENSATION REACTION

Amino Acid



Carboxylic End and Amine End
Can react with itself
(or similar molecules) in a chain

Polypeptide

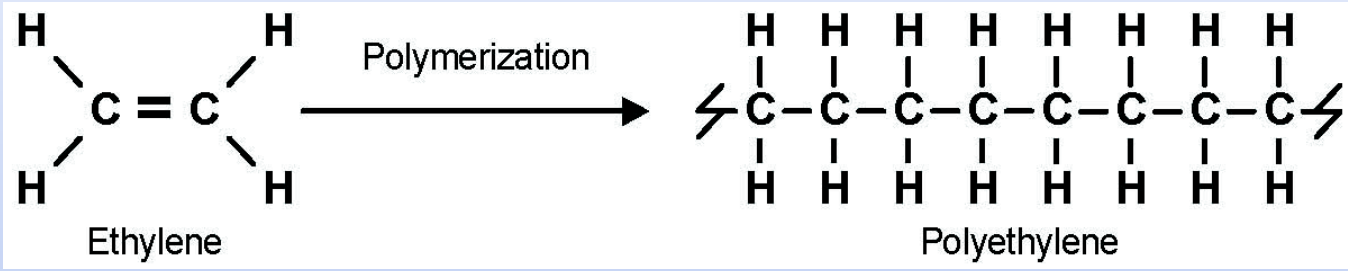


Two distinct ends
N-terminus is an amine
C-terminus is a carboxylic acid

Such a compound is called a polymer

monomer

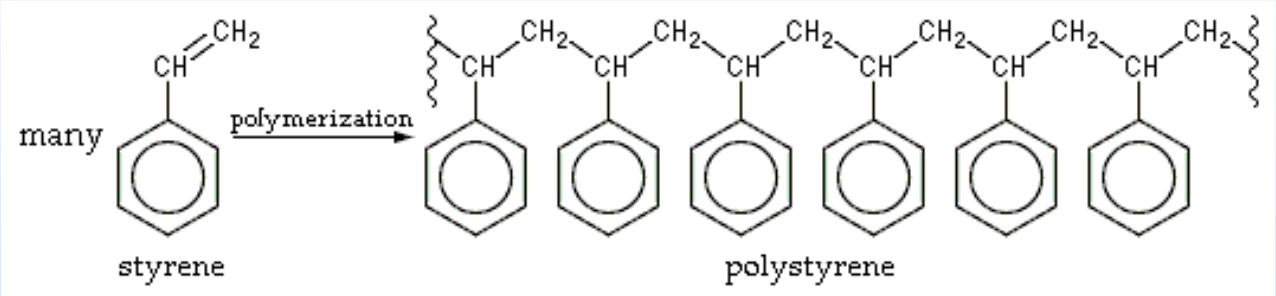
polymer



really really big molecule
macromolecule

polyethylene = plastic shopping bag

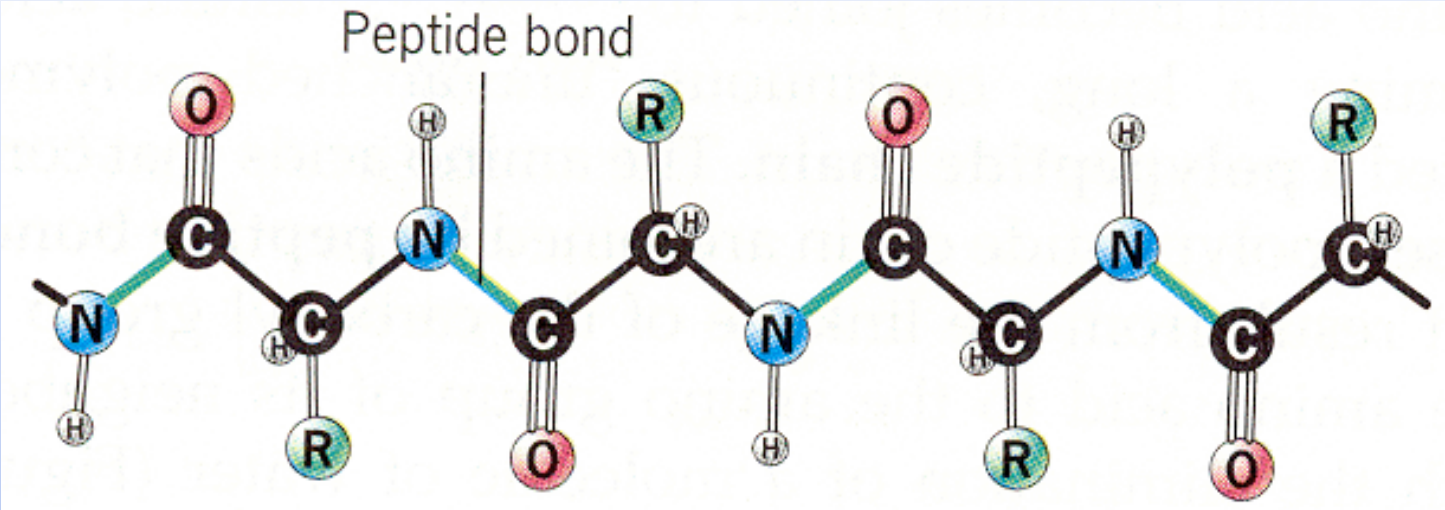
Addition Reaction
(combined no other molecule "lost")



Another addition polymerization

Polystyrene
"styrofoam"

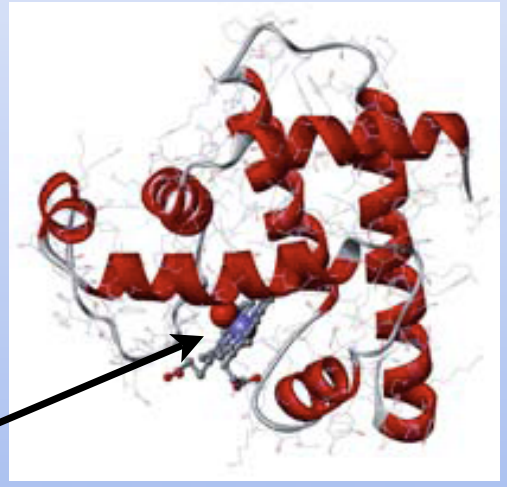
Biopolymer (polymer that is biologically relevant)



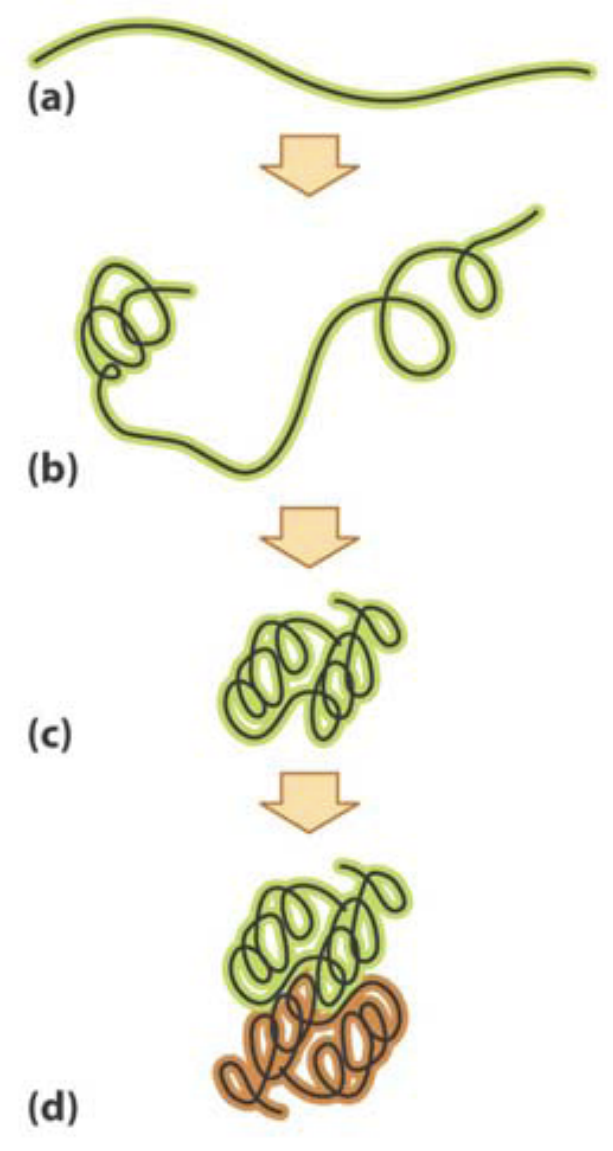
monomer = amino acid

Condensation Polymerization

Polypeptides have unique structures that give them function (proteins)



binding site
might be an enzyme
(catalyst)



primary structure = sequence

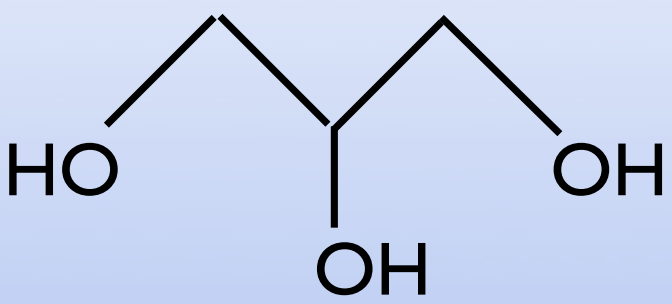
secondary structure = folds

tertiary structure = 3-D arrangment

quaternary structure = interactions with other proteins

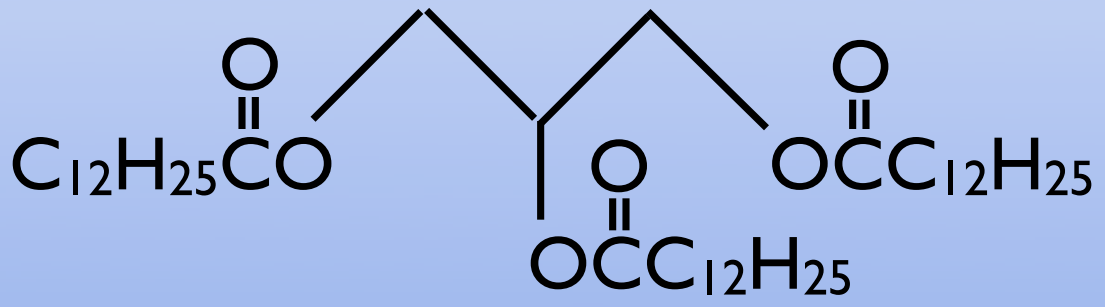
Triglycerides
(same condensation reaction)

Gylcerol



Fatty Acid
(carboxylic acid with long chain)

$C_{12}H_{25}COOH$



Makes Trigylceride

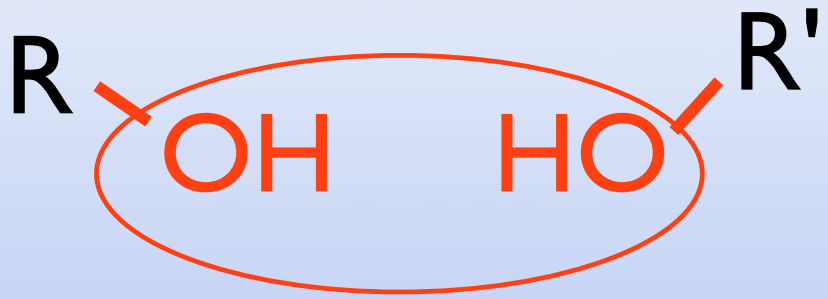
The three fatty acids can
all be the same or different

High levels of triglycerides is linked to
build up of plaque in the arteries
= heart disease

saturated fats	unsaturated fats
all sp^3 carbon	some sp^2 carbon
(no double bonds)	(some double bonds)
strong intermolecular forces	weaker intermolecular forces
solid	liquid
(lard, crisco, ...)	(canola oil, olive oil, ...)

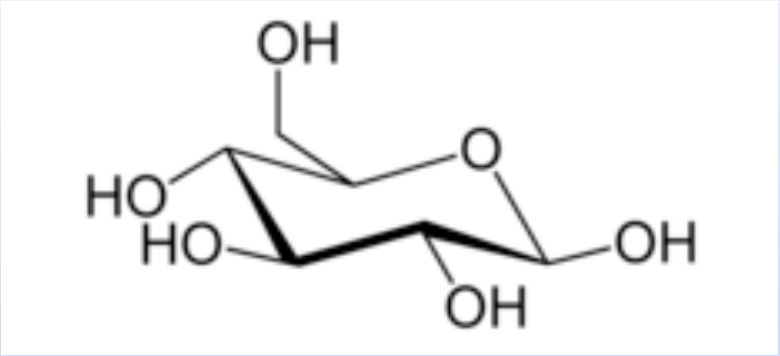
Condensation reaction for two alcohols

Alcohol Alcohol



Ether + Water

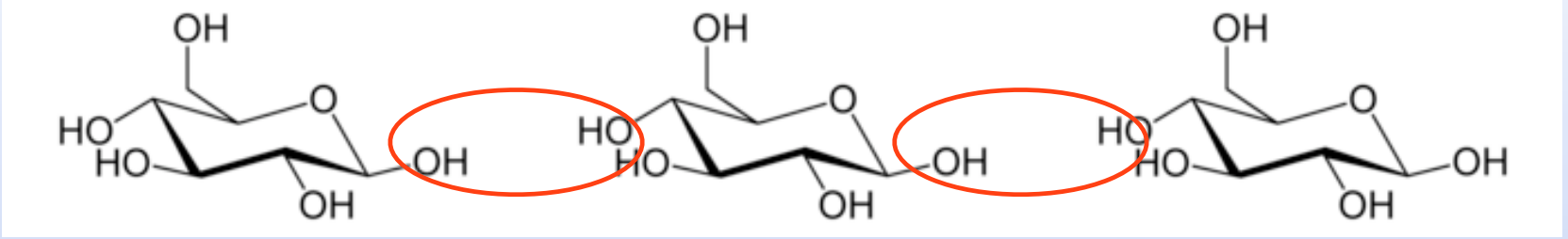
Sugars

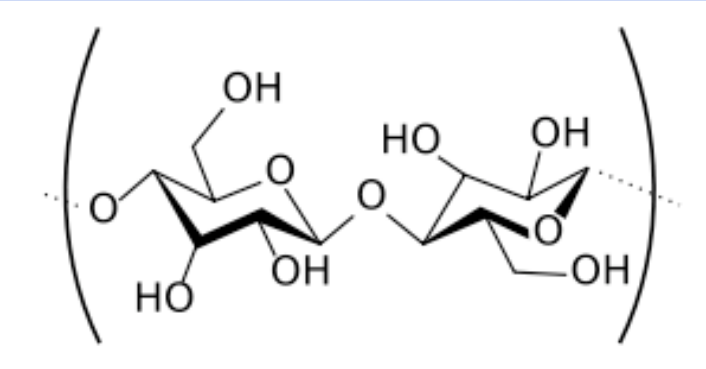


Glucose
(key factor for sugars lots of hydroxyls)

They can react to form chains of sugars
polysaccharide

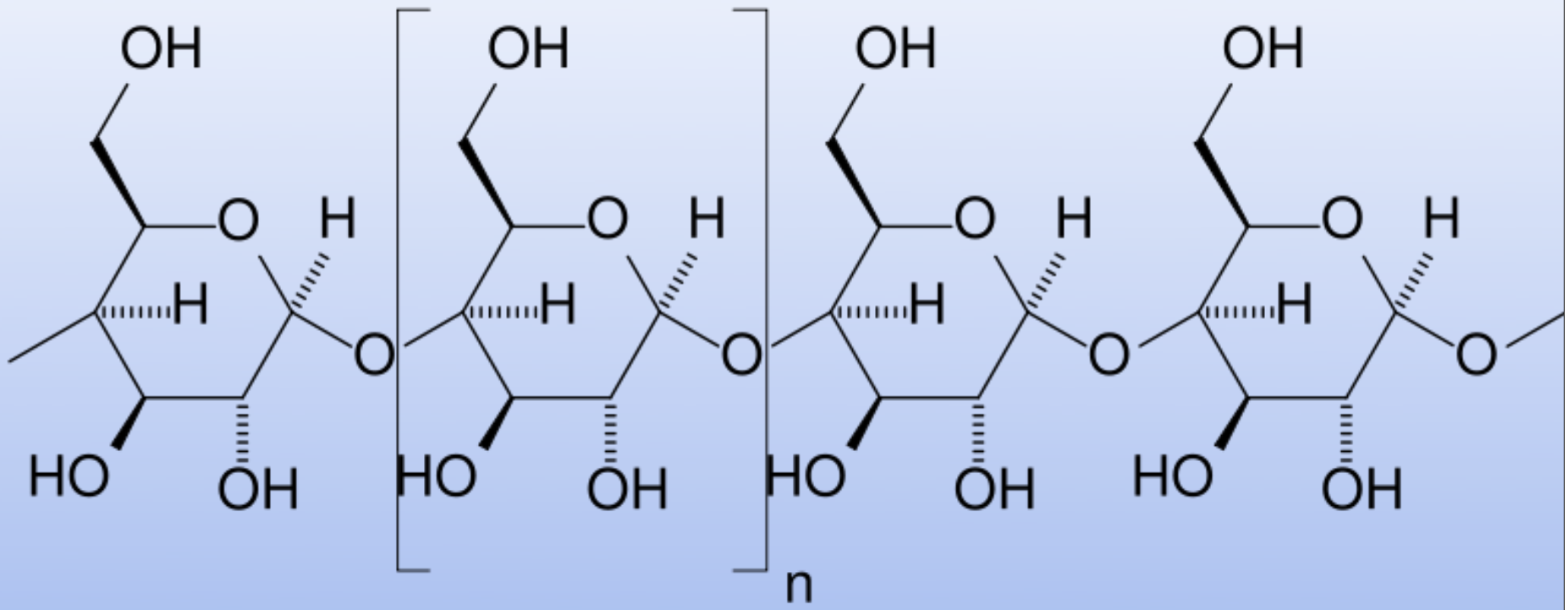
Celluose



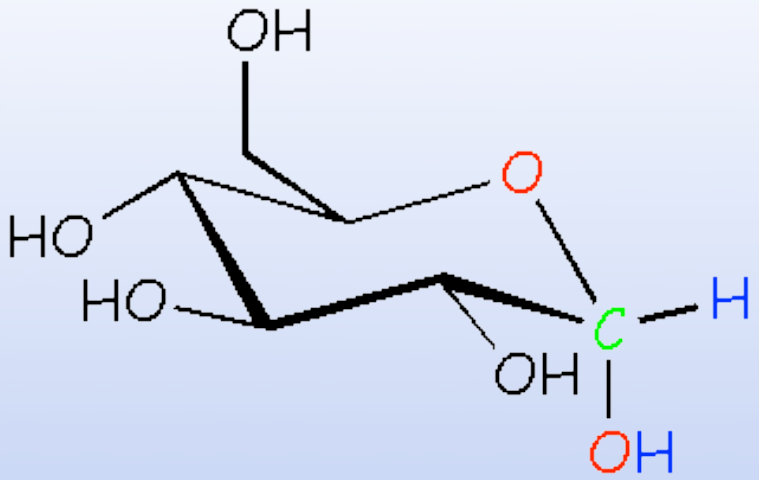


Very long ether chain
(pretty much all plant material)

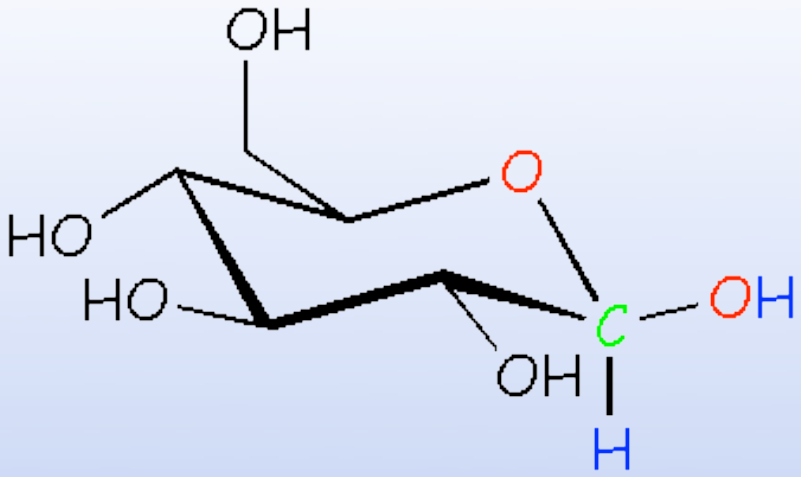
Polysaccharide (Starch)



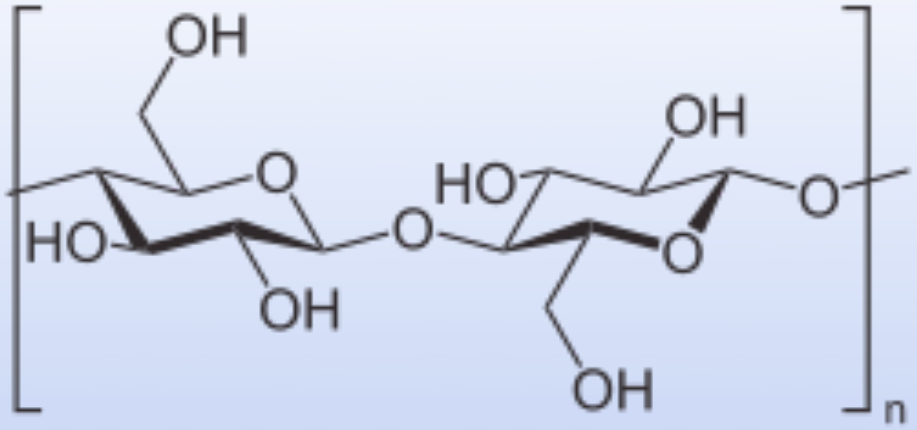
Sugars, Carbohydrates
monosaccharides (one)
disaccharides (two)
polysaccharides (many)



α Glucose



β Glucose



β 1,4 linkage polysaccharide
Cellulose

α 1,4 linkage polysaccharide
Starch/Carbohydrate

Condensation Reactions
(two molecules make one + water)

Carboxylic Acid + Amine = Amide + water

Carboxylic Acid + Alcohol = Ester + water

Alcohol + Alcohol = Ether + water

Structurally what is different between RNA and DNA

A. the phosphate

B. the sugar

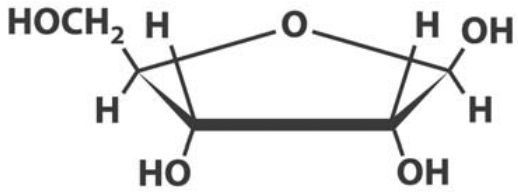
C. the base

Structurally what is different between RNA and DNA

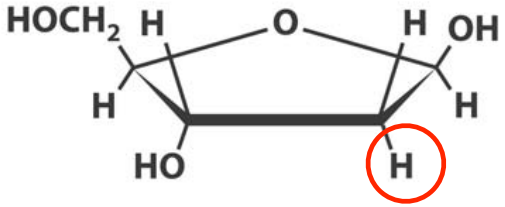
A. the phosphate

B. the sugar ←

C. the base



20 Ribose, $C_5H_{10}O_5$

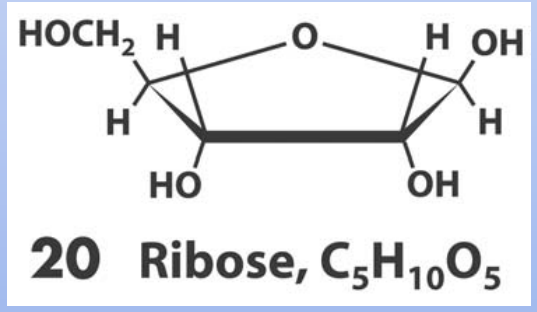


21 Deoxyribose, $C_5H_{10}O_4$

Other important biopolymers

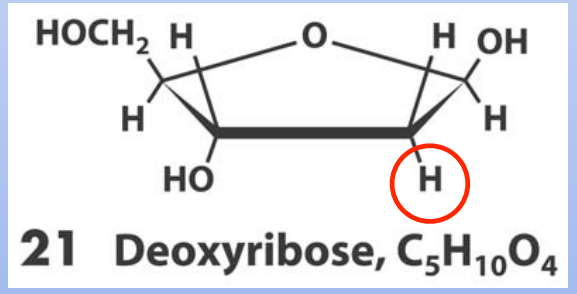
(RNA and DNA)

Three pieces Base, Sugar, Phosphate



20 Ribose, $C_5H_{10}O_5$

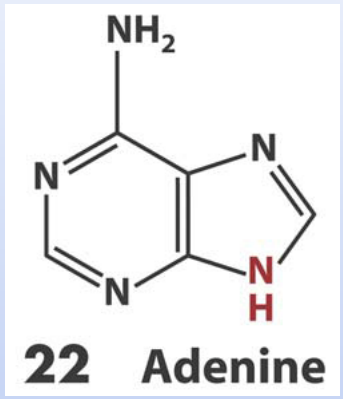
RNA sugar



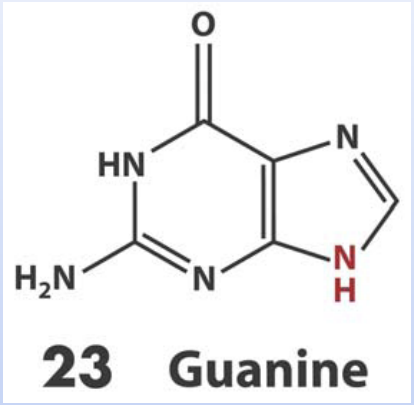
21 Deoxyribose, $C_5H_{10}O_4$

DNA sugar

Base units (4 DNA base units)

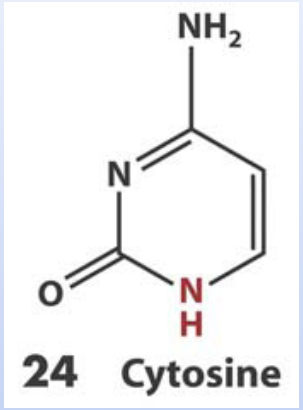


22 Adenine

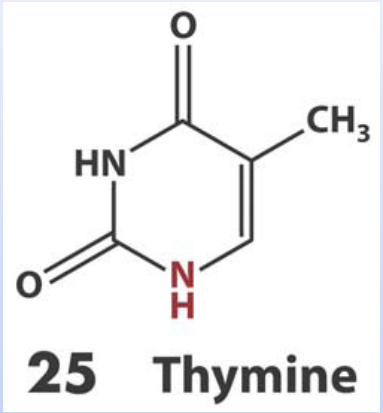


23 Guanine

guanidine

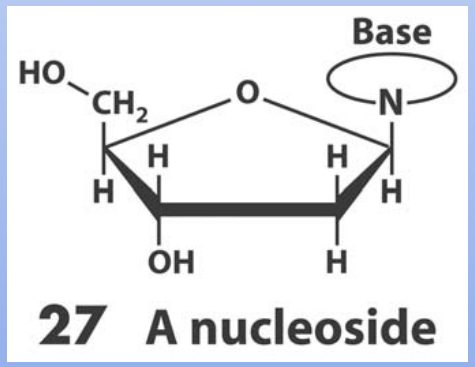


24 Cytosine

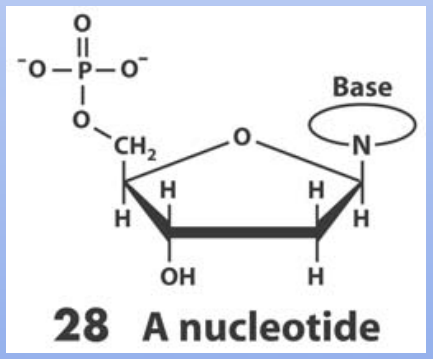


25 Thymine

pyrimidine

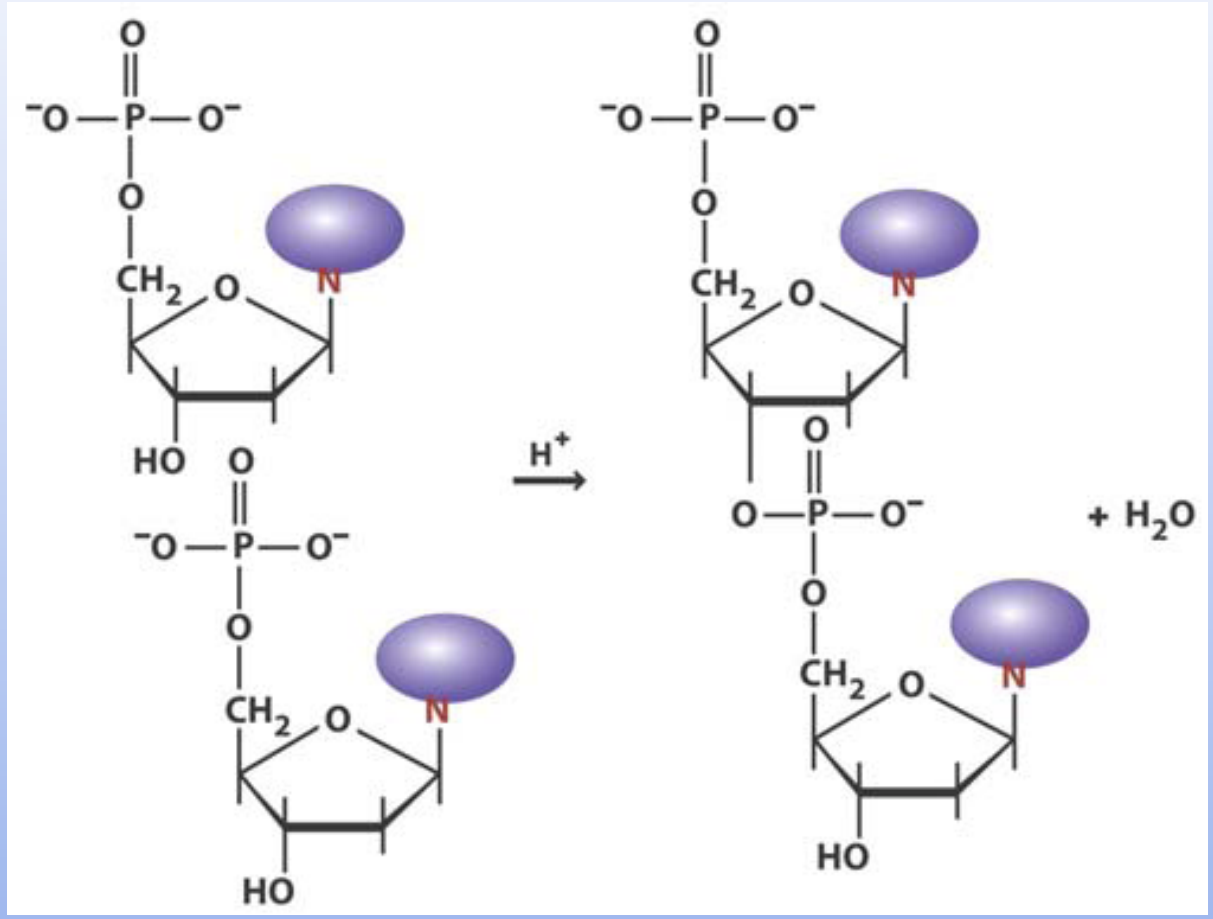


27 A nucleoside



28 A nucleotide

Put it all together and you get a polymer



opposite of this reaction is hydrolysis

what about tertiary structure?
double helix due to hydrogenbonds